**Effects of solution concentration on the properties of Cu4SnS4 thin films.**


ABSTRACT

Copper tin sulfide thin films were electrodeposited on the indium tin oxide substrate from an aqueous solution containing CuSO4, SnCl2 and Na2S2O3 at pH 1. Deposition at various concentrations was attempted in order to study the effect of electrolytes concentration on the film properties. The thin films were characterized using X-ray diffraction and atomic force microscopy. The absorption properties, band gap energy and transition type was determined using UV-Vis Spectrophotometer. The thin films produced were polycrystalline in nature. The XRD data showed that the most intense peak is at $2\theta = 30.2°$ which belongs to (221) plane of Cu4SnS4. The AFM images indicated that the lower concentration leads to smaller crystal size, as well as higher optical absorption values. The optimum bath composition was found to be 0.01 M for CuSO4, Na2S2O3 and SnCl2. The band gap value was found to be 1.7 eV with indirect transition.



**Keyword:** Bandgap energy; Electrodeposition; Semiconducting material; Solar cells; Thin films.